and the children will observed to see if they accept a second serving. This will determine how likely the mother and child is to accept the solution and whether it, on the basis of taste, is an improvement over ORS.

4.2 PHASE # 2: COMPARATIVE HOME FIELD TRIAL

4.2.1. Type of study: Controlled field trial

4.2.2. Population: Children presenting to a BHU with diarrhea with the following criteria:
* Age between 6 months and 5 years
* Uncomplicated diarrhea (>3 loose stools/day)
    -absence of blood in stools
    - fever <38.5
    -no evidence of other diseases such as malaria, otitis media, pneumonia.
* Duration >12 hours < 5 days
    * No signs of dehydration
    * Weight/height >80%
    * Willingness of mother/care-giver to participate

4.2.3. Sampling: 100 children

4.2.4. Study group/Control group: Two BHUs from geographical separate camps will be used. 50 children from one will be placed on the control ORS packets and 50 from the other will be placed on the study solution, WSS.

4.2.5. Methodology:

* Baseline data: Children who fit the case criteria will be referred by the BHU physician to a LHV trained for the project. She will gather baseline data on the child and provide training for the mother (or care-giver) on how to make and administer the solution to the child. The training will include:

-information about diarrhea/effects
-feeding during and after diarrhea
-demonstration of the ORT preparation
-return demonstration by the caregiver
-how much of the ORT to give/duration of treatment

The following baseline data will be collected on each child:

* Identifying information: age, sex, address etc.
* Weight/height
* Duration of diarrhea.
* Stools/day (perceived)
* Stool consistency (soft or watery)
* Feeding frequency before diarrhea
* Current feeding frequency
* Degree of dehydration (if + eliminate)
* Treatments used for this episode
* Breastfeeding/fluids (stopped/same/increased)

*Follow-up data:An LHV trained for the project will follow these children for 7 consecutive days in the home. She will gather the following data as indicators of the study objectives:

1. Utilization rates:

* Evidence that the solution was made.
* Measurement amount of solution used/day
* Number of days solution used
* Other treatments used (traditional/drugs)

2. Perceived effectiveness by mother:

* Per mother: number of stools/day
* Per mother: stool consistency
* Per mother: when the diarrhea ended. (appearance of 1 formed stool)

3. Replacement of food by ORT

* Per mother: daily feeding frequency.

4. Recipe recall/mixing errors

* Mothers will be asked to recite the recipe.
* Stated amounts of water used will be measured
* On 10% of each group samples of solutions made will be sent to Aga Kahn University for osmolarity and sodium analysis.

5. Failures- referral back to BHU

* Development of dehydration. Daily exams will be preformed.

* Diarrhea lasting > 7 days

6. Maternal acceptability:

* On the last visit the care-giver will be asked specificquestions as to acceptability and problems encountered. This will be followed by a open-ended focus group discussion with the mother and other female relatives involved in the care of the child to obtain more qualitative information on acceptability.

4.2.6. Data analysis:

The following data from the study and control group will be compared and analyzed to determine if WSS is at least equal to if not better than ORS packets in terms of:

* utilization rates
* recipe recall
* mixing errors
* feeding frequencies
* perceived stool frequency
* perceived duration of diarrhea
* perceived stool consistency improvement
* acceptability/problems encountered
* failure rates

These data will be analyzed by a statistician under the supervision of Dr. Majid Molla.

WSS will be introduced to the Afghan population (Phase # 3) if the following criteria are met:

* Utilization rates of WSS > ORS
* Recipe recall with WSS > ORS
* Mixing errors with WSS < ORS
* Feeding frequencies are not lower in the WSS group
* Perceived stool frequency/duration of diarrhea/ liquid stool consistency on WSS < ORS
* Failures on WSS < ORS

4.3 PHASE # 3: IMPLEMENTATION OF WHEAT SALT SOLUTION PROJECT

4.3.1. Population: Afghan family units residing in refugee villages in the Kohat district of NWFP where primary health care (PHC) programs exist. Total population: 291,883 Afghan refugees.

4.3.2. Implementors: Male Community Health Workers (948) Female Health Workers (1212) -each responsible for 30 families.

4.3.3. Methodology:

* Training: All (CHW) Community Health Workers and (FHW) Female Health Workers (who as PHC workers have already had CDD training) will be instructed on the recipe and use of WSS. Two "Master Trainers" one male and one female will be trained to conduct 2 sessions of a 2 day workshop for the Community Health Worker Supervisors (CHS) which include 32 persons and Female Health Worker Supervisors (FHS), 24 persons. These supervisors will then train their volunteer CHW (948) and FHW (1212) staff who are responsible for training their 30 constituent families. As they are unpaid staff, the supervisors are given 50 rupees each to provide refreshments for their CHW training workshops as incentives. The Project Director will be responsible for training the Master Trainers and supervising the CHW, FHW workshops. Dissemination of the ORT information to the refugee population is as follows:

Project Director

(1 month training)

(1) Male Master Trainer(1) Female Master Trainer

(2 sessions @ 2 days/session) (2 sessions @ 2 days/session)
(8 days)

(32)Community Health Supervisors (24)Female Health Supervisors

2 sessions @ 1 day/session6 sessions @ 1 day/session
(30 CHW/CHS @ 15/session)(46FHS/FHW @ 6-8/session)
(8 days)

(948) Community Health Workers(1212) Female Health Workers

(2 months) (2 months)(2 months)

30 Families (male members)30 Families (female members)

* Curriculum Topics:
Review of:
-causes of diarrhea
-prevention of diarrhea
-effects of diarrhea (malnutrition/dehydration)
-dangerous signs\when to seek help at BHU
-feeding during diarrhea
WSS:
-how to make WSS
-when to start
-how much to give
-how long to treat

* Materials: Information gathered from Phases 1 and 2 will be used for the recipe, verbal messages, and training methodology. Visual aids previously field tested during the BHU Phase # 2 will also be utilized. The Project Director will be responsible for putting together the above materials.

4.3.4 Monitoring:

TRAINING: Each level of training will be monitored and evaluated on an ongoing basis over a 6 month period after the CHS and FHS workshops. The Project Director with the Master Trainers will monitor:

1) CHS/FHS training CHW/FHWs-all sessions
2) CHW/FHW training families-20 CHW/ 20 FHW
3) Family knowledge post training-30 randomly selected families

Training process indicators will be designed to measure the Supervisors and Health Worker trainers based on the training curriculum objectives:

-% explaining causes and prevention of diarrhea
-% explaining feeding during diarrhea
-% stating when to start home treatment
-% demonstrating correct recipe.
- correct amount of salt
- correct amount of wheat
- correct amount of water
-% stating correct amounts to give/for how long
-% teaching correctly signs of complications
-% asking mother to return demonstration.
-% using visual aids correctly.

Training impact indicators will be designed to measure how well the target audience (families trained by CHWs) have learned the information disseminated by their community health worker through questioning them on:
-causes of diarrhea
-prevention of diarrhea
-feeding during diarrhea
-recipe recall/recipe demonstration
-when to start/amount to give/length of treatment

4.3.5 Evaluation: Ten months after implementation of household training on the use of WSS, a 30 cluster survey will be conducted in the district, interviewing 7 mothers with children under age 5 per cluster. The survey will be conducted by 2 teams of 2 Pakistani interviewers who have had experience with previous health surveys here in NWFP (CDD,EPI, and Nutrition surveys) They will receive additional training by the Project Director for this specific survey. The following indicators will be used to assess the impact of the program:

* frequency of home ORT use
* home ORT solution used
    * ORT recipe recall
* ORT recipe demonstrated

These results will be compared to the same variables used during the previous CDD survey done in 1989 by UNCHR. If there is at least a 3 fold improvement in the above indicators, WSS will be established as the home ORT solution of

choice for both refugee programs here in Pakistan and for cross-border Afghan operations. It will be included in the Refugee Health Care CDD Policy and Procedures Guidelines as put forth through UNHCR, the Project Directorate for Health, Commission for Afghan Refugees, and ACBAR (Agency Coordinating Body for Afghan Relief). It will be introduced through the Community Health Worker network in all of the provinces that host Afghan refugees (NWFP, Baluchistan, and the Punjab and in the cross border health programmes.

5. DOCUMENTATION AND DISSEMINATION OF RESULTS

5.1. QUALITY CONTROL OF DATA

-All data collection instruments will be designed under the supervision of Dr. Majid Molla with a consultant statistician.

-These instruments will be field tested for 1 month before use with appropriate revisions made after such trials.

-During Phase # 1 the Project Director will be present at the focus groups to monitor the process. All questions and answers will be recorded in local language then translated into English for analysis. During Phase # 2 daily monitoring will be done on data collectors (LHVs) by the Project Director or Project Secretary/Assistant. During Phase # 3, monitoring of training will be done by the Project Director and Master Trainers. The Survey Team will be monitored periodically in the homes and all data reviewed daily with the Project Director.

-Data will be logged on a daily basis and reviewed by the consultant statistician and by Dr. Molla on his site visits every 8 weeks.

-Final analysis will be carried out by the statistician consultant and the Project Director under the supervision of Dr. Molla.

5.2. REPORTING/ACCOUNTABILITY

-Quarterly financial reports will be prepared by IRC and submitted to Aga Khan Foundation and any other additional or co-funding sources assisting with the project.

-Monthly summaries of the project status, constraints, and progress will be reported verbally and in telex form to AKF-PK, AKF-Geneva, additional or co-funding sources.

- A full report after each phase will be submitted to the below interested parties. Depending on the results, and upon discussions of such, the project will move to the next phase.

* Aga Khan Foundation (PK)(Geneva)
* Additional/Co-Funding Sources
* UNICEF, Afghan program
* UNHCR
* ACBAR
* IRC, NYC

5.3 DISSEMINATION OF RESULTS

The final results of the project will be disseminated for local and international agency use:
UNHCR: Pakistan/Geneva
ACBAR: Local NGOs
UNICEF:Afghan/Pakistan, NYC/CDD Programme
WHO: Afghan/Pakistan Programs, Geneva CDD Programme
ICDDR: Bangladesh
ICHF: Wn DC.

A series of papers will be prepared for presentation at forums such as: ICORT IV, International Symposium on Cereal Based ORT, NCIH Annual Conference, the Annual AKHS and PHC Managers Conference, and other ORT/CDD related conferences. These will also be submitted for publication to journals focused on CDD. The following results can be presented from the collected data:

* Afghan womens' beliefs regarding diarrheal diseases
* Afghan use of WSS in treating illnesses
* Childrens' taste preference ORS versus WSS
* Afghan womens hand measurements in making WSS
* WSS osmolarity results from preparation in Afghan women's homes.
* Maternal acceptance of WSS versus ORS
* Mixing errors: WSS versus SSS and ORS
* User rates of WSS versus SSS and ORS
* Afghan womens training methodology in teaching home based cereal solution (WSS)
* Visual aids to teach the use WSS solutions and diarrheal disease control among Afghans
* Mothers' perceptions on stool frequency, stool consistency, and duration of diarrhea WSS.
* Cereal based solutions (WSS) replace feeding during diarrhea, fact or fantasy?
* Barriers to the use of ORS packets among Afghan refugee women.

6. SIGNIFICANCE OF THE PROJECT

This will be the first field trial on wheat as an ORT home based solution. To establish wheat as a reliable base for ORT this study will provide additional data gathered in home settings on WSS:

1. While osmolar studies have been conducted on rice ORT in hospital and laboratory settings none exist in the published literature on home-made WSS. This will establish the benefit of this cereal in terms of the reduction of potential mixing errors.

2. This project will establish the home recipe of WSS in terms of the amounts of wheat/salt delivered by Afghan womens' hand measurements.

If wheat proves to be successful for Afghans, it may be beneficial for other wheat producing developing countries.

As this study is applied research, it will offer significant data on the transference of ORT technology into rural households. Not only will it contribute to our knowledge on the application of cereals (WSS) in village settings, but it will offer some insights on barriers to the use of ORS packages in the prevention of diarrhea. It will explore a number of new user-based methodologies in assessing and applying cereal ORT in the home:

1. When considering the utilization and acceptance of a new treatment modality, clinical efficacy is not as vital as is a mothers' judgment of efficacy . This project employs as study variables the mothers' perception of diarrhea frequency, duration, and consistency. This method may be used in other such applied research.

2. Maternal and child taste preferences as a user-based study variable that will give us more insight on the frequently cited barrier to ORT utilization.

3. Employing traditional Afghan teaching methodologies will offer a new training technique for ORT programs.

There are a number of questions and theoretical concerns on the use of cereal based solutions in the home that this study will answer:

1. Do mothers perceive the clinical benefits of a cereal-based solution (wheat)?

2. Will cereal solutions (wheat) replace vital feeding necessary during the course of diarrhea?

There is little published information of Afghan womens knowledge, attitudes, and practices on diarrhea. This project will not only gather these data but directly apply it within ORT training strategies.

Cereal solutions are best suited for home use due to their low cost, availability, and simple preparation. This project will draw attention to the use of cereals in home settings as opposed to commercial preparations or on hospital use. Thus, it will encourage greater utilization of cereal solutions as a first line treatment locally and internationally, saving the precious resources of ORS packets in poorer developing countries for those more serious cases who are dehydrated and need a balanced formula.

It will also put greater emphasis on early treatment in the home to prevent the complications of dehydration. As it is more simple, palatable, and easy to prepare, it can encourage such early intervention. ORS may not promote early home preventive treatments as well as it does not diminish diarrhea as the cereals. Furthermore is the problem of ORS costs and the difficulties faced in supplying adequate amounts for each case of childhood diarrhea.

Afghan women are responsible for the health care of their children in the home and due to purdah are not able to leave their homes easily to buy packets. An accessible home solution is therefore imperative for this population. This project will offer Afghan women and others in the developing world greater self reliance within her home to treat her sick child with diarrhea.

Salt-sugar solution as a home solution has been questionably successful globally and has failed within the Afghan refugee population. Only 3 percent have used it and of those, 96 percent were preparing it incorrectly, leading to potentially dangerous complications. The Afghan population being exposed to home solution training, will expect some form of home intervention.
This project will offer an alternative and replacement to SSS for the Afghan population and others in the developing world where SSS has been problematic.

Afghanistan has the worst health statistics in the world with respect to Infant Mortality Rates, Child Mortality Rates, and deaths due to diarrhoeal diseases. These statistics after 10 years of war are likely worse than reported. The infrastructure of the country in terms of the delivery of health care services, communications, and transportation has been destroyed. There will not be the resources for appropriate control of diarrheal diseases as related to health centers, health workers, and ORS packets. Therefore, case management of diarrhea will be left up to the Afghan mother in the home. This project offers the mother an appropriate, efficacious treatment strategy for this critical situation as she faces repatriation, potentially reducing deaths from diarrhea in Afghan children.

1. BACKGROUND/RATIONALE

1.1 Scope of the Problem: Diarrheal Disease among Afghan Children

Diarrhea is a critical problem in Afghan children inside Afghanistan as well as among the refugee population currently living in camps within Pakistan. Before the Soviet occupation and subsequent war of resistance, Afghanistan had the highest infant and child mortality rates in the world. Today this trend persists.

According to UNICEF's State of the Child 1990, the child mortality rate from all causes in Afghanistan is 97 per 1000 population of children under age 5 (300 per live births)[1]. Due to the total devastation of the country over the last 10 years and extreme difficulties in gathering health statistics, this figure is likely a conservative one.

Expatriate medical personnel and Afghan medics working inside this war-torn country estimate much higher mortality rates, with diarrhea accounting for the majority of deaths. Gastrointestinal complaints are reported to be the most common medical diagnosis, diarrhea the number one cause [2]. No accurate data is available on specific diarrheal mortality, but as diarrhea is the biggest killer of children in developing countries, one can safely assume that it is probably the most common cause of child mortality in Afghanistan today.

More definitive data have been gathered on displaced Afghans living as refugees in Pakistan. In spite of considerably more available health care services, a variety of surveys have documented that diarrheal diseases are a critical problem in this setting as well. A 1987 survey conducted by the International Rescue Committee in 10 Afghan camps revealed overall child mortality rates of 104 per 1000 under 5 child population. Of all deaths, 52.6 percent had a history of diarrhea. Morbidity from diarrheal diseases was also predominant with 27.7 percent of the surveyed children having suffered from a diarrheal episode two weeks prior to the survey [3].

More recently in 1989, the United Nations High Commission for Refugees (UNHCR) conducted a large scale provincial-wide diarrheal survey using the World Health Organization's Control of Diarrheal Disease (WHO/CDD) methodology. This took place in the North West Frontier Province (NWFP) where most of the Afghan refugees reside (2.5 million). 40 percent of all childhood deaths were found to be associated with diarrhea. 16.5 percent of the 5755 children under age 5 in the survey had an active case of diarrhea on the day of the interview and 21 percent during the previous two weeks. The annual incidence of diarrhea was reported at 4.7 episodes per year per child under age 5 and the average duration, 9.2 days [4].

A similar WHO/CDD survey among Afghan children was also done in the southern province of Baluchistan during the winter months of 1988-1990. Overall child mortality was 69.8 per 1000 under 5 population with 54 percent associated with diarrhea. Children there experience an average of 12.6 episodes of diarrhea per year lasting an average 8.4 days. 45 percent of the surveyed children had an episode of diarrhea during the previous two weeks [5].

In summary, child mortality among Afghan refugees is quite high . One half of this mortality is associated with diarrhea (40-54 percent). The annual diarrhea incidence rates among Afghans exceed rates reported globally (3.3/child/year) and are up to 4 times the rates reported in the Eastern

7. **INPUTS/REQUIRED RESOURCES**

7.1.PHASE # 1

7.1.1. Training/Materials Development
* focus group questions pre-test
* data collection forms pre-test
* focus group leader/recorder training
* analysis of data

7.1.2. Supplies
* Office supplies/Report printing costs
* 1 gold scales
* ORT supplies: wheat,salt,ORS, gas burner

7.1.3. Staff
* 1 Project Director:salary,benefits,airfare,relocation
* 1 Aga Khan Consultant (Dr.Molla): airfare/fees
* 1 Consultant anthropologist (2 weeks)
* 1 Secretary/Assistant: salary,benefits
* 2 Afghan focus group investigators: salary
* 1 Interpreter (for Afghan dialects)
* 1 Driver for PD: salary,benefits

7.1.4. Support
* Office: contribution to rental
* 1 Vehicle of PD-for entire 2 years
* Fuel/maintenance
* 1 House rental-Project Director
* Communications: telephone/fax to Aga Khan
* Travel: per diem within province for staff

7.2 PHASE #2

7.2.1. Training/Material Development
* design of data collection forms
* pre-testing of forms
* training of BHU medical officer
* training of LHVs
* visual aids: design/pre-testing/training
* data analysis

7.2.2. Supplies
* ORT equipment for BHUs
* Office supplies/Report printing costs
* Visual aids
* Test costs: sodium, osmolarity

7.2.3. Staff

* 1 Project Director: salary,benefits
* 1 Aga Khan Consultant (Dr.Molla): airfare/fees
* 1 Consultant Statistician: consultant fee (6 weeks)
* 1 Secretary/Translator: salary,benefits
* 6 Study Lady Health Visitors: salary
* 2 IRC Lady Health Visitors: salary additions
* 4 Community Health Workers: salary
* 1 Driver for PD: salary,benefits

7.2.4. Support

* Office: contribution to rental
* 2 Vehicle rentals with drivers for 6 Study LHVs
* Fuel/maintenance (3 cars)
* 1 House rental-Project Director
* 1 House rental-for 6 LHVs
* Communications: telephone/fax to Aga Khan

7.3 PHASE # 3

7.3.1. Training/Materials Development

* CHW/FHW messages development/translations
* Workshop costs
* Development of training assessment tools
* Analysis of monitoring data/survey data

7.3.2. Supplies

* Office supplies/Report printing costs
* laminated pictures
* printed messages
* demonstration ORT supplies

7.3.3. Staff

* 1 Project Director: salary,benefits,airfare
* 1 Secretary/Translator: salary,benefits
* 1 Aga Khan Consultant (Dr. Molla): airfare/fees
* 1 Consultant Statistician: consultant fee (2 weeks)
* 2 Master Trainers: salary
* 56 CHS per diem fees
* Training costs for CHW sessions for 56 CHS
* 4 Survey team members
* 1 Driver for PD: salary,benefits

7.3.4. Support

* Office: contribution to rental
* 1 Vehicle rental with drivers (for Trainers) 9mo
    * 2 Vehicle rentals with drivers (for Survey Teams) 2mo
* Fuel/maintenance (4 cars)
* 1 House rental-Project Director
* Communications: telephone/fax to Aga Khan

8. IMPLEMENTATION TIME LINE

PHASE # 1

TASK	Month	1	2	3	4	5	6	7	8	9	10	Recruitment
Focus Group (2 wks) Leaders(FGL)		x										
FG questions (2 wks) data collection forms development		x										
FGL training(2 wks)		x										
Pilot FG (2 weeks) questions/forms		x										
Conduct FGs(1 mo)		x										
Data analysis(1 mo)			x									
Report preparation FG data/results (1 mo)		x										

PHASE # 2

TASK	Month	1	2	3	4	5	6	7	8	9	10
Recruitment of LHVs (1 mo)			x								
Training materials (1 mo) development			x								
Visual aids development pre-testing (1 mo)			x								
Data collection forms development/piloting (1 month)				x							
Training LHVs/(1 month) Medical Officers(2 days)				x							
BHU Home Study(3 months) data collection			x x	x							
Data analysis			x	x							
Report preparation BHU/Home study results		x x									
TASK	Month	1	2	3	4	5	6	7	8	9	10

PHASE # 3

TASK	Month	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Develop training materials/monitoring tools (1 mo)		x													

TASK Month	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Recruit Trainers (2 wks)		x														
Train Master Trainers (1 m o)																x
CHS/FHS training with messages,visual aids 4 Workshops 2 days each (8 days)				x												
Pilot training monitoring tools			x													
CHS/FHS train CHW/FWH 8 sessions 1 day/session (8 days)				x												
Monitoring of training sessions (8 days)				x												
CHW/FHW train families (2 mo)		x	x													
Monitoring of CHW/FHW training families	x	x														
Evaluate training with families (4 mo)	x	x	x	x												
Cluster survey (2 mo)	x	x														
Data analysis (2 mo)													x	x		
Survey report preparation (2 mo)														x	x	

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Mediterranean region (2.7). An Afghan child will experience from 5-12 episodes of diarrhea a year lasting from 8-9 days. One could thus expect a child to be suffering from diarrhea during 30 percent of the year.

It is clear from these data that diarrheal diseases is a particularity critical problem for the Afghan refugee population in Pakistan and, more than likely, worse inside of Afghanistan. Therefore as a health care concern, diarrheal diseases should be the highest priority in program planning for Afghans.

1.2 Current Treatment Interventions: Problems with ORS/SSS

For more than a decade, oral rehydration therapy (ORT) has been documented to reduce child mortality from diarrhea [6]. UNICEF estimates that of the 5 million childhood deaths annually from diarrhea, 3.5 could be prevented by the use of oral rehydration therapy [7]. Within Afghan health programs, WHO-recommended oral rehydration solution (ORS) packages with balanced electrolytes are used to treat mild to moderate dehydration. Home made salt/sugar solutions (SSS) are promoted for the prevention of dehydration. While each of these interventions can be efficacious under ideal conditions, there are considerable problems with their use here in Pakistan. It is likely they will be even more difficult to implement inside of Afghanistan when the refugee population moves home.

When considering commercial ORS packets, a huge supply and a reliable health care infrastructure is necessary for their distribution and utilization. Kielman in his 1985 study, "Control of Deaths from Diarrheal Disease in Rural Communities", estimates that in an underdeveloped rural area, a child would need up to 10 ORS packets per year for diarrhea treatment [8]. In NWFP Pakistan, if the average incidence of diarrhea is 5 episodes per year per child each lasting 9 days, and the child needs a one-liter packet each day, a mother would require up to 45 packets yearly for each child. To treat each case of diarrhea in Afghan children in NWFP alone, a supply of 19 million packets would be required. According to the local UNICEF, Pakistan office, the total supply of ORS packets available in this country is only 6 million as of 1990.

After ten years of war, there are very few supervised health care centers inside of Afghanistan and a limited number of well trained health care providers. Much of the transportation network has been destroyed by military activities. Most supplies arrive by pack animals or by foot. Afghanistan has a largely mountainous terrain, with 85 percent of the population concentrated in isolated villages connected to each other only by trails. Therefore even with massive amounts of international aid, supplying adequate and equitable amounts of ORS packets to village mothers for each case of childhood diarrhea will be logistically close to impossible. Consequently, early treatment with home remedies will be essential in this situation where ORS packets are difficult to distribute.

Currently, a salt/sugar solution (SSS) is being taught to mothers in the Pakistani refugee camps. Literature reviews suggest that mixing errors with this method are frequent [9]. It is difficult for the mother to accurately measure 1 liter of fluid with both packet ORS and SSS. Furthermore, some programs use a recipe that calls for teaspoons to measure the salt and sugar. As there are no standard teaspoon sizes, this leads to either too much or too little sugar and salt in the SSS solutions. Highly concentrated solutions will increase diarrhea, whereas a low or hypotonic solution will not properly hydrate the child. It is particularity difficult for Afghan women to use this

recipe as they cook with hand measurements. Scoop and pinch measurements used in other programs can yield even more erroneous concentrations, especially on the part of sugar [9].

Surveys in NWFP clearly document the same problems that are found in the literature. An informal survey by IRC in one of their camps revealed that Afghan women consistently made errors preparing SSS. Most used less that 1 liter of water (range 500-800 ml) resulting in a hypertonic solution. The majority of women had forgotten the correct recipe and few were utilizing SSS. Of those who prepared SSS, the majority of woman had added two to four times the appropriate amount of salt and sugar which can lead to dangerous osmotic diarrhea and hypernatremia.

The 1989 WHO/CDD UNHCR survey in NWFP revealed that 23 percent of all households had heard of SSS and only 3 percent had used it. Of those users, only 5 percent recited the recipe correctly and still fewer (4 percent) prepared it correctly. Three quarters of the SSS users added the wrong amount of sugar. The second most common error was using the incorrect volume of water. An inaccurate amount of salt accounted for another 34 percent of the errors [4].

The same survey in Baluchistan Province revealed somewhat better results, but overall the use of SSS was poor. 10 percent of households has used SSS as a home treatment for diarrhea and of these only 16.5 percent made it correctly [5].

These data point to 2 major problems. First, very few are utilizing SSS. Among the reported barriers to utilization of SSS globally is the unacceptable taste of the solution. It is a common complaint of women and children world-wide as recently documented in a summary of the behavioral aspects of ORT programs and in field trials [10][11][12]. It is also not a traditionally used diarrheal antidote in most cultures.

The cost of sugar is also a reported constraint on the utilization of SSS globally [10][11][12]. While sugar is a commonly available commodity in 84 percent of the Afghan homes surveyed in refugee camps[4], sugar is currently an expensive commodity. This is especially so inside of Afghanistan. It is four times the price per kilo of wheat flour and twice the price of rice. (Average prices in afghanis: sugar is 230/kilo, rice is 110/kilo, wheat flour is 48/kilo)[13].

Since the barriers to SSS use has not been examined among Afghans, it is unknown if these factors may be contributing to low utilization rates. This is a common failure in health care policy planning because few programs allocate funds to study the cultural and practical appropriateness of health interventions <u>before</u> implementation.

The second more alarming problem found in the surveys, is the poor rate of recipe recall and the unacceptable high numbers who made critical mixing errors. Although these results may reflect input problems, for example, poor training techniques on the part of health personnel, it also suggests that SSS is just too difficult to easily teach Afghan women. At this point in time it appears that this intervention as currently used may in fact be dangerous and creating more harm than good. This clearly calls for a major shift in home treatment policies.

1.3 Cereal Based Solutions: Review of Studies

Due to the above constraints and problems, there has been much interest world-wide and here in Afghan health programs on the potential use of cereal based solutions. Since 1981, numerous hospital based clinical trials have been done on a variety of cereal staples, rice ORS being the most scrutinized. Ground rice with added electrolytes (rice ORS) has been compared to standard ORS packets in 13 published studies [14]. They have demonstrated not only that rice ORS is safe, but in most trials, rice ORS was significantly superior to ORS packets in terms of improved weight gains, more rapid rehydration time, and diminished stool purging rates [14].

Solutions containing 50-80 grams of rice have a lower and less variable solution osmolarity (concentration). With this low concentration, more calories per liter can be delivered without the risk of hyperosmolar diarrhea and increased fluid losses [15][16]. This nutritional benefit does not replace the vital need for feeding during diarrhea though. Additionally, hyperosmolar solutions containing more than 80 grams of rice are too thick to drink. This naturally prevents a child from consuming a solution that is too concentrated.

These studies have thus demonstrated that rice ORS compared to standard glucose ORS rehydrates more efficiently, reduces diarrhea, is nutritionally superior, and is a safer solution as mixing errors are less critical.

Two extensive field trials have been done in Indonesia and in Bangladesh with rice water home solutions. In the former study a solution was made by cooking whole grain rice until soft, adding salt, then giving the water supernate to the child. In Bangladesh, a ground rice powder was used to make the solution. Maternal and child satisfaction was high in both studies due to improved taste of rice water and its perceived greater nutritional value over SSS [11][12].

For countries where rice is not the common staple, other cereals such as wheat, maize, and sorghum have been studied [17]. Dr. Majid Molla, formerly of ICDDR, Bangladesh now at Aga Khan University in Karachi, has been a leading researcher in rice ORS. More recently he has conducted 2 clinical trials using wheat and other cereals. He reports similar success replacing the glucose component of ORS with wheat flour [18][19]. As with rice, wheat ORS yielded faster rehydration times and lower fluid requirements for hydration than standard ORS (by 48 percent). Stool frequency during the diarrheal episode was also diminished by 30 percent. These results employing wheat as the base are consistent with two other former clinical trials done in Ethiopia and in Thailand [20][21]. Although the clinical efficacy of wheat as a cereal base has been proven to equal rice, there are to date no published field trials to test the application of wheat in a village setting.

For home use, wheat based oral rehydration solution can be made with simple hand measurements by adding two fists-fulls of wheat flour (yielding approximately 40-50 grams) to a little over 1 liter of cold water, cooking the solution until it bubbles, then adding 2 three-finger pinches of salt [22]. This solution involves less time in cooking than a whole grain rice solution. It also yields a low osmotic solution (from 175 to 206 osmols as compared to 330 of commercial ORS) thus providing the same benefits as with rice in providing more calories per liter with low risks of mixing errors [23].

1.4 Application of Wheat Based ORT Among Afghans

Rice with its proven efficacy in clinical and field trials could be an excellent choice for a home ORT program among Afghans. From informal surveys, Save the Children-UK (SCF-UK) reports that some women have used rice water in the past for the home treatment of diarrhea. In many areas of Afghanistan, rice is seen as a luxury food item and is reserved only for guests or special occasions. While this may limit its overall use, on the other hand if it is seen as a precious commodity, it may be perceived as a "better" cereal base.

Yet many people working inside of Afghanistan report that rice is currently not readily available. Due to the terrain of Afghanistan, it is only grown in limited areas. Furthermore, the war has destroyed and disrupted agricultural and communication systems resulting in even less rice stocks. The price varies between 60 afghanis/kilo to 158 /kilo [13]. While whole grain rice can be used to make rice water, more time and fuel is needed to prepare it as compared to using the already ground flour of wheat for a wheat ORT solution.

Wheat flour is the cheapest and most common staple among Afghans. It is universally available in every Afghan household. Wheat products are medicinally used in a wheat/oil/sugar paste for post partum care of women. Wheat is traditionally known as a good treatment for "weakness" in children [24] and is used as a weaning food in the form of a gruel or porridge [25].

As rice is not as available as wheat, is more expensive, and requires additional time and fuel to prepare as an ORT solution, it will not be a practical cereal base in Afghanistan. Therefore, a series of feasibility pilots using wheat have been conducted here in Pakistan with the refugee population.

In August 1988 two small focus groups with Afghan women and dais were gathered in Lakhti Banda camp. They were asked to determine which cereal based solution would be appropriate for Afghans. In an Afghan home and in a Maternal Child Health Center, they attempted to prepare both a rice and wheat salt solution (the former with ground rice). Both groups felt that wheat was a more practical home solution for Afghans due to the universal availability of wheat flour. It took less time to prepare and the taste was an improvement over SSS. Accompanying children enthusiastically consumed the wheat salt solution [25].

Another small pilot project was conducted in April 1989 using wheat salt solution. Lady Health Visitors taught women in their homes how to make the solution. Three weeks after training, 21 women reported that at least one of their children had diarrhea. All had used the wheat salt solution, either alone or in combination with physician prescribed medication. They all felt that it was easy to prepare and 88 percent demonstrated the correct recipe. 80 percent of the mothers felt that their child preferred the solution over SSS and commercial ORS [26].

From these preliminary investigations, it appears that there is a strong potential in using wheat as a ORT base among Afghans. It has the following advantages:

1) low cost of wheat
2) availability of wheat flour
3) familiarity of taste with wheat products
4) less cooking time
5) improved taste over SSS and ORS
6) ease of mixing with hand measurements

7) recipe easier to remember (1 liter, 2 fists, 2 pinches) 4) lower osmolarity making mixing errors less critical
8) more efficient rehydration solution
8) improved nutritional value
9) reduction in number of stools which may encourage mother to continue the treatment.
10) boiling reduces the risk of water contaminants in the solution

Since SSS is rarely utilized and is so difficult to prepare correctly, a wheat based solution must be seriously considered. Early treatment with a wheat solution will not only better prevent dehydration, but save precious supplies of commercial ORS for those children with more serious complications. Wheat home solutions are not intended to replace electrolyte balanced ORS packets because the potassium and bicarbonate components in home solutions are inadequate. But in reality an Afghan mother in an isolated village may not have access to ORS packets. She therefore must be empowered with a safe and effective home solution that a wheat based solution offers for early treatment of diarrhea before dehydration starts.

Before a wheat based solution can be promoted, it is necessary conduct field trials in an Afghan community to determine if it would be used, acceptable, and a culturally appropriate cereal based solution.

While wheat as oral rehydration base has been demonstrated to be safe and highly effective in controlled hospital studies, it is important to see if these clinical benefits translate into a perceived superiority in the eyes of Afghan women. A theoretical concern which has been raised by WHO and other ORT specialists, is that cereal bases may be perceived as food and thus replace crucial feeding during diarrhea. Until this undocumented problem is evaluated under field conditions, it will remain an obstacle to the implementation cereal based solutions.

This project proposes to answer these questions under field conditions now while there is an pressing need to find a safer alternative to SSS home solution before the Afghans repatriate and are logistically more difficult to reach.

The camps in Pakistan lend themselves to an ideal situation for a field evaluation and program implementation due to the accessibility of the population through the Basic Health Units, community outreach workers, and trained traditional birth attendants. If the wheat based solution proves acceptable to Afghan women and children, it may encourage wider and earlier use of home oral rehydration therapy with the potential of averting many unnecessary deaths in children. As the Afghans face repatriation in the near future to a country depleted of resources and infrastructure, the need for a simple, appropriate home based solution to prevent diarrheal mortality is urgently needed.

2. PROJECT GOAL

The overall goal of this proposed project is to provide a more palatable, low cost, accessible, safe, easily prepared, and efficient home solution to increase utilization of early home oral rehydration therapy. Specifically, the project will evaluate the application and acceptance of wheat salt solution (WSS) as a replacement to salt-sugar solution (SSS). This will be done in the semi-controlled setting of Afghan camp refugee households in order to determine the feasibility of using it now and in the future in Afghanistan when the population returns home.

3. PROJECT OBJECTIVES

The specific aims of this project are as follows:

3.1. To gather background information on Afghan womens' knowledge, attitudes, and practices concerning childhood diarrhea in order to teach women about diarrheal diseases and to determine if WSS is feasible, practical, and culturally acceptable option as a base for a home oral rehydration solution.

3.1.1. To identify with what criteria mothers define diarrhea and its harmful effects.

3.1.2. To determine how mothers treat diarrhea, traditionally or conventionally.

3.1.3. To identify what is the most common staple in the Afghan home.

3.1.4. To document if cereals are used in some form for the home treatment of diarrhea and which one is most commonly used.(wheat or rice products)

3.1.5 To determine in what forms cereals are consumed in homes and specifically how wheat is used in childhood diarrhea and in weaning.

3.1.6. To determine if there are cultural or social barriers to the use of wheat salt solution as an alternative to salt sugar solutions as a home oral rehydration solution.

3.1.7 To determine if the taste of wheat salt solution is acceptable to mothers and children.

3.2. To validate by weights the recommended wheat salt solution recipe:

-2 fists fulls of wheat flour
-2 three-finger pinches of salt
-1 liter of cold water
-cook until the solution just bubbles

3.2.1. To weigh the average amounts of wheat and salt delivered by Afghan womens' hand measurements using locally available ingredients.

3.2.2. To identify the most common fluid container in Afghan homes.

3.3. To determine the most appropriate way to train women on the preparation of wheat salt solution.

3.3.1. To determine the teaching methodology Afghan women use to teach each other cooking recipes.

3.4. To evaluate the maternal and child acceptance and or problems encountered in making and using a wheat based solution.

3.5. To determine if the rate of recipe recall is improved and mixing errors less with wheat salt solution in order to provide a safer home solution.

3.6. To determine if user rates of home solutions are improved after the introduction of a wheat salt solution.

3.7. To determine if the mother perceives improved effectiveness on the stool frequency rates, stool consistency, and duration of her child's episode using wheat salt solution.

3.8. To determine if wheat salt solution is seen as a food and thus reduces the amount the child is fed during diarrhea.

3.9. To determine if there are failure rates using wheat salt solution in non-dehydrated children with diarrheal diseases.

4. **METHODOLOGY**

This project will be conducted in three phases under the auspices of the International Rescue Committee and with the supervision of Dr. Majid Molla, Chairman of the Department of Paediatrics at Aga Khan University School of Medicine. Phase # 1 is to determine the cultural variables and perceptions affecting the utilization of wheat salt solution. Phase # 2 will look at the application of the wheat salt solution in refugee homes and Phase # 3 will implement wheat salt solution into the refugee diarrhea program.

4.1. PHASE # 1: BACKGROUND BEHAVIORAL INFORMATION

4.1.1. Type of study: Descriptive information will be gathered in this phase using focus group methodology [27] to gather the information.

4.1.2. Population: Afghan mothers with children under age 5 residing in accessible camps in NWFP.

4.1.3. Stratified sampling: 10 randomly selected households containing 6-8 woman representing the 5 major ethnic groups that live in Afghanistan (2 groups each of Pathan, Tajiik, Hazara, Turkoman, and Uzbeck).

4.1.4. Data collection:

* Knowledge, attitudes and practices:

Open ended questions (based on objectives under 3.1) will be posed to the group for their consideration by an Afghan woman trained in leading focus groups. Another Afghan woman will record all questions and comments. Using the methodology suggested by Krueger [27], this information will be analyzed with the assistance of Pamela Hunte, Medical Anthropologist, specializing in Afghan maternal-child health practices, or a local anthropologist with a similar background. These data will be used: (1) to determine the feasibility of using wheat salt solution (2) to design diarrhea related health education materials.

* Validation of Recipe:

During these focus groups, information will also be gathered on vessels available in Afghan homes to determine a way of measuring a liter. 10 Afghan women's scoop and pinch sizes will be measured on 10 trials each with a locally available gold scale to determine the average amount of wheat and salt delivered. The recommended recipe for WSS will be based on the results of these trials.

* Teaching Methodology:

Each group will be asked to teach the interviewers a common Afghan dish in order to determine the teaching methodology that Afghan women use with each other. This methodology will be used to develop training techniques for the use of the WSS.

* Taste Test:

100 mothers and 100 children, male and female, aged 5 (10 each per group) will be collected and one by one individually asked to taste cups of both ORS commercial packet solution and WSS. They will be asked their simple preference

PROJECT PROPOSAL

WHEAT BASED ORAL REHYDRATION HOME SOLUTIONS:
A FIELD TRIAL AND IMPLEMENTATION PROGRAM
FOR THE TREATMENT OF DIARRHEA
AMONG AFGHAN REFUGEE CHILDREN

SUBMITTED BY HELEN H. MURPHY, FNP,MHS

IN COLLABORATION WITH DR. MAJID MOLLA, AGA KHAN UNIVERSITY

INTERNATIONAL RESCUE COMMITTEE, PAKISTAN

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